Space Weather Forecast

Issued on Friday, 18 February 2022 at 12:33 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: G1/Minor geomagnetic storm intervals likely in to new week.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the past 24 hours, with isolated low-level common-class flares observed. These were mainly spawned from two areas of the sun, firstly a region narrowly over the northwestern solar horizon, but the largest event came from a small unipolar spot in the northeast at 17/2051UTC.

The past 24 hours saw a sharp reduction in sunspot count, with all of the western solar hemisphere groups fading, leaving a sparse and mainly magnetically unipolar eastern solar hemisphere. The most complex sunspot region was inactive and lay nearer the sun's central portion.

No Earth-directed Coronal Mass Ejections (CMEs) were in evidence in available satellite imagery in the past 24 hours. There is some evidence to suggest a minor 'filament' (arc of plasma) may have been ejected concurrently with the long-period common class flare, however this is very faint - if even attributable to this event - and directed above the Sun-Earth plane (to no effect at Earth).

Solar Wind / Geomagnetic Activity: The solar wind, was characterised by a slow regime, but with a rising trend in most measures. The cause of this is uncertain, but may be related to a close pass by a minor CME, for lack of any forecast coronal hole high speed streams.

The solar wind speed was stable within typical background levels in the period, however the number of particles in the solar wind displayed a rise to become slightly elevated with time. There was also a slight enhancement in lower energy particles at another satellite, which may perhaps indicate a possible close pass by a minor CME, with this possibly in course recently at a satellite trailing Earth in its orbit by around 30 degrees. The magnetic field associated with the particles rose in magnitude over the same interval, peaking at slightly elevated levels before stablising later in the UTC morning of Friday.

The net result of the above solar wind measures was provisionally quiet geomagnetic indices throughout - very near the bottom of the measurement scale.

Energetic Particles / Solar Radiation: The high energy proton flux (related to solar radiation storms) has tracked very slightly above background levels since around 12 hours after an evidently very large and energetic X-ray flare and CME seen on satellite imagery from the rearward eastern solar hemisphere on 15 February. This has plateaued near 1pfu (where S1 is 10pfu) and is unlikely to increase further (in the absence of further such events).

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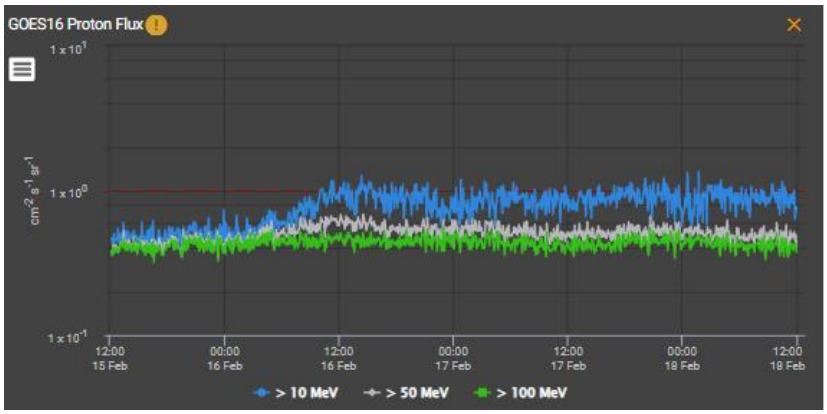
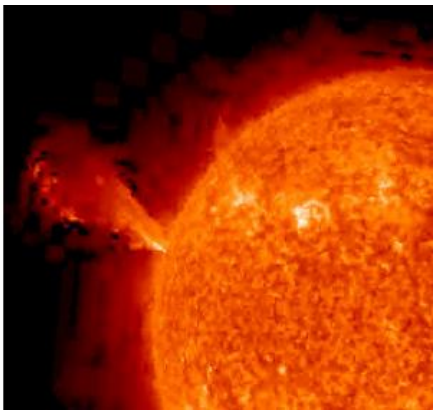
Figure 1: (Left) high energy proton flux for the past 72 hours in the near-Earth environment – this is a measure of solar radiation storm response.

Note the increase in the lowest energy protons into 16 February to 1e0 (i.e. 1pfu, where S1 is at the very top of the chart at 10pfu). Although this fell a long way short of S1, the event that caused it was a long way from being near the best-connecting part of the sun for solar radiation storms (being the western horizon) – instead being near the worst-connected eastern horizon.

Right: the event that spawned this enhancement, as seen in false-colour extreme UV light from around 30 degrees trailing Earth in the track of its orbit. This emission extends around half a solar radius out into space.

This region is the posited cause of a likely increase in the risk of X-ray flares when (and if) it arrives on the front-side into the new working week.





Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to be low at first given the sparsely populated Earth-facing side of the sun, however there are indications that a large and potent region (responsible for the solar radiation mentioned above) may rotate onto the Earth-facing side into the new working week. The magnitude of this increase will be assessed when the spot responsible becomes visible to analyse.

Solar Wind / Geomagnetic Activity: No CMEs feature in this forecast period.

Solar winds should remain in a slow regime until the possible onset of a pair of 'coronal hole' fast wind streams in succession over the second half of the four-day period, giving likely G1 Minor Storm intervals on Sunday 20 February, and a chance of continuation on Monday, else being largely quiet.

Energetic Particles / Solar Radiation: No solar radiation storms are expected during the period, with the very slightly disturbed high energy proton trace relaxing through the period.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	60	40
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	5	5	5	5
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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